SEQUENCE LISTING

<110>   Valentis, Inc.
        Nordstrom, Jeff
        Freimark, Bruce
        Deshpande, Deepa

<120>   Gene Expression and Delivery Systems and Uses

<130>   213-0063US

<140>   US 09/754,014
<141>   2001-01-03

<150>   US 08/948,958
<151>   1997-10-10

<150>   US 60/028,687
<151>   1996-10-10

<160>   19

<170>   PatentIn version 3.3

<210>   1
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<213>   Homo sapiens

<400>   1

Met Cys His Gln Gln Leu Val Ile Ser Trp Phe Ser Leu Val Phe Leu
1   5   10   15

Ala Ser Pro Leu Val Ala Ile Trp Glu Leu Lys Lys Asp Val Tyr Val
            20   25   30

Val Glu Leu Asp Trp Tyr Pro Asp Ala Pro Gly Glu Met Val Val Leu
        35   40   45

Thr Cys Asp Thr Pro Glu Glu Asp Gly Ile Thr Trp Thr Leu Asp Gln
    50   55   60

Ser Ser Glu Val Leu Gly Ser Gly Lys Thr Leu Thr Ile Gln Val Lys
65   70   75   80

Glu Phe Gly Asp Ala Gly Gln Tyr Thr Cys His Lys Gly Gly Glu Val
                85   90   95

Leu Ser His Ser Leu Leu Leu Leu His Lys Lys Glu Asp Gly Ile Trp
            100   105   110

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Ser Thr Asp Ile Leu Lys Asp Gln Lys Glu Pro Lys Asn Lys Thr Phe
        115             120             125


Leu Arg Cys Glu Ala Lys Asn Tyr Ser Gly Arg Phe Thr Cys Trp Trp
    130             135             140


Leu Thr Thr Ile Ser Thr Asp Leu Thr Phe Ser Val Lys Ser Ser Arg
145             150             155             160


Gly Ser Ser Asp Pro Gln Gly Val Thr Cys Gly Ala Ala Thr Leu Ser
            165             170             175


Ala Glu Arg Val Arg Gly Asp Asn Lys Glu Tyr Glu Tyr Ser Val Glu
            180             185             190


Cys Gln Glu Asp Ser Ala Cys Pro Ala Ala Glu Glu Ser Leu Pro Ile
        195             200             205


Glu Val Met Val Asp Ala Val His Lys Leu Lys Tyr Glu Asn Tyr Thr
    210             215             220


Ser Ser Phe Phe Ile Arg Asp Ile Ile Lys Pro Asp Pro Pro Lys Asn
225             230             235             240


Leu Gln Leu Lys Pro Leu Lys Asn Ser Arg Gln Val Glu Val Ser Trp
            245             250             255


Glu Tyr Pro Asp Thr Trp Ser Thr Pro His Ser Tyr Phe Ser Leu Thr
            260             265             270


Phe Cys Val Gln Val Gln Gly Lys Ser Lys Arg Glu Lys Lys Asp Arg
        275             280             285


Val Phe Thr Asp Lys Thr Ser Ala Thr Val Ile Cys Arg Lys Asn Ala
    290             295             300


Ser Ile Ser Val Arg Ala Gln Asp Arg Tyr Tyr Ser Ser Ser Trp Ser
305             310             315             320


Glu Trp Ala Ser Val Pro Cys Ser
            325
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<210> 2
<211> 987
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Seq list.ST25.txt

<213>   homo sapiens

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gtggccatat gggaactgaa gaaagatgtt tatgtcgtag aattggattg gtatccggat   120

gcccctggag aaatggtggt cctcacctgt gacacccctg aagaagatgg tatcacctgg   180

accttggacc agagcagtga ggtcttaggc tctggcaaaa ccctgaccat ccaagtcaaa   240

gagtttggag atgctggcca gtacacctgt cacaaaggag gcgaggttct aagccattcg   300

ctcctgctgc ttcacaaaaa ggaagatgga atttggtcca ctgatatttt aaaggaccag   360

aaagaaccca aaaataagac ctttctaaga tgcgaggcca gaattattc tggacgtttc   420

acctgctggt ggctgacgac aatcagtact gatttgacat tcagtgtcaa aagcagcaga   480

ggctcttctg acccccaagg ggtgacgtgc ggagctgcta cactctctgc agagagagtc   540

agaggggaca caaggagta tgagtactca gtggagtgcc aggaggacag tgcctgccca   600

gctgctgagg agagtctgcc cattgaggtc atggtggatg ccgttcacaa gctcaagtat   660

gaaaactaca ccagcagctt cttcatcagg gacatcatca acctgaccc acccaagaac   720

ttgcagctga gccattaaa gaattctcgg caggtggagg tcagctggga gtaccctgac   780

acctggagta ctccacattc ctacttctcc ctgacattct gcgttcaggt ccagggcaag   840

agcaagagag aaaagaaaga tagagtcttc acggacaaga cctcagccac ggtcatctgc   900

cgcaaaaatg ccagcattag cgtgcgggcc caggaccgct actatagctc atcttggagc   960

gaatgggcat ctgtgccctg cagttag   987

<210>   3
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<212>   DNA
<213>   artificial sequence

<220>
<223>   codon optimized Human IL-12 p40

<400>   3
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gtggccatct gggagctgaa gaaggacgtg tacgtggtgg agctggactg gtaccccgac   120

gcccccggcg agatggtggt gctgacctgc gacacccccg aggaggacgg catcacctgg   180

accctggacc agagcagcga ggtgctgggc agcggcaaga ccctgaccat ccaggtgaag   240

gagttcggcg acgccggcca gtacacctgc cacaagggcg cgaggtgct gagccacagc   300

ctgctgctgc tgcacaagaa ggaggacggc atctggagca ccgacatcct gaaggaccag   360

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aaggagccca agaacaagac cttcctgcgc tgcgaggcca agaactacag cggccgcttc    420

acctgctggt ggctgaccac catcagcacc gacctgacct tcagcgtgaa gagcagcagg    480

ggcagcagcg accccccaggg cgtgacctgc ggcgccgcca ccctgagcgc cgagcgcgtg    540

cgcggcgaca acaaggagta cgagtacagc gtggagtgcc aggaggacag cgcctgcccc    600

gccgccgagg agagcctgcc catcgaggtg atggtggacg ccgtccacaa gctgaagtac    660

gagaactaca ccagcagctt cttcatccgc gacatcatca gcccgaccc ccccaagaac     720

ctgcagctga agcccctgaa gaacagccgc caggtggagg tgagctggga gtaccccgac    780

acctggagca ccccccacag ctacttcagc ctgaccttct gcgtgcaggt gcagggcaag    840

agcaagcgcg agaagaagga ccgcgtgttc accgacaaga ccagcgccac cgtgatctgc    900

cgcaagaacg ccagcatcag cgtgcgcgcc caggaccgct actacagcag cagctggagc    960

gagtgggcca gcgtgccctg cagctag                                        987
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<210>   4
<211>   987
<212>   DNA
<213>   artificial sequence

<220>
<223>   codon optimized human IL-12 p40

<400>   4
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gtggccatct gggagctgaa gaaagacgtg tacgtggtcg agctggactg gtaccccgac    120

gcccccggcg agatggtggt cctgacctgc gacaccccg aggaagacgg catcacctgg     180

accctggacc agagcagtga ggtgctgggc tccggcaaga ccctgaccat ccaggtgaag    240

gagttcggcg acgccggcca gtacacctgc cacaagggag cgaggtgct gagccactcc      300

ctcctgctgc tccacaaaaa ggaggacggc atctggagca ccgacatcct gaaggaccag    360

aaggagccca agaacaagac cttcctgcgc tgcgaggcca agaactacag cggccgcttc    420

acctgctggt ggctgaccac gatcagcacc gacctgacct tcagtgtgaa gagcagcagg    480

ggctccagcg accccccaggg cgtgacctgc ggcgctgcca ccctgagcgc cgagcgcgtg    540

cgcggcgaca acaaggagta cgagtacagc gtggagtgcc aggaagactc cgcctgcccc    600

gccgctgagg agagcctgcc catcgaggtg atggtggacg ccgttcacaa gctgaagtac    660

gagaactaca ccagcagctt cttcatccgc gacatcatca gcctgaccc acccaagaac     720

ctccagctga agcccctcaa gaactcccgc caggtggagg tgagctggga gtaccccgac    780

acctggagca cgccccactc ctacttctcc ctgaccttct gcgtgcaggt ccagggcaag    840
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Seq list.ST25.txt

agcaagcgcg agaagaaaga ccgggtgttc accgacaaga ccagcgccac cgtcatctgc   900

cgcaagaacg ccagcatcag cgtgcgcgcc caggaccgct actatagctc ctcttggagc   960

gagtgggcca gcgtgccctg ctcctag   987

<210> 5
<211> 219
<212> PRT
<213> homo sapiens

<400> 5

Met Cys Pro Ala Arg Ser Leu Leu Leu Val Ala Thr Leu Val Leu Leu
1   5   10   15

Asp His Leu Ser Leu Ala Arg Asn Leu Pro Val Ala Thr Pro Asp Pro
            20   25   30

Gly Met Phe Pro Cys Leu His His Ser Gln Asn Leu Leu Arg Ala Val
        35   40   45

Ser Asn Met Leu Gln Lys Ala Arg Gln Thr Leu Glu Phe Tyr Pro Cys
    50   55   60

Thr Ser Glu Glu Ile Asp His Glu Asp Ile Thr Lys Asp Lys Thr Ser
65   70   75   80

Thr Val Glu Ala Cys Leu Pro Leu Glu Leu Thr Lys Asn Glu Ser Cys
                85   90   95

Leu Asn Ser Arg Glu Thr Ser Phe Ile Thr Asn Gly Ser Cys Leu Ala
            100   105   110

Ser Arg Lys Thr Ser Phe Met Met Ala Leu Cys Leu Ser Ser Ile Tyr
        115   120   125

Glu Asp Leu Lys Met Tyr Gln Val Glu Phe Lys Thr Met Asn Ala Lys
    130   135   140

Leu Leu Met Asp Pro Lys Arg Gln Ile Phe Leu Asp Gln Asn Met Leu
145   150   155   160

Ala Val Ile Asp Glu Leu Met Gln Ala Leu Asn Phe Asn Ser Glu Thr
                165   170   175

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Seq list.ST25.txt
```
Val Pro Gln Lys Ser Ser Leu Glu Glu Pro Asp Phe Tyr Lys Thr Lys
            180                 185                 190


Ile Lys Leu Cys Ile Leu Leu His Ala Phe Arg Ile Arg Ala Val Thr
        195                 200                 205


Ile Asp Arg Val Thr Ser Tyr Leu Asn Ala Ser
    210                 215
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<210> 6
<211> 660
<212> DNA
<213> homo sapiens

<400> 6
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tcccaaaacc tgctgagggc cgtcagcaac atgctccaga aggccagaca aactctagaa   180

ttttacccctt gcacttctga agagattgat catgaagata tcacaaaaga taaaaccagc   240

acagtggagg cctgtttacc attggaatta accaagaatg agagttgcct aaattccaga   300

gagacctctt tcataactaa tgggagttgc ctggcctcca gaaagacctc ttttatgatg   360

gccctgtgcc ttagtagtat ttatgaagac ttgaagatgt accaggtgga gttcaagacc   420

atgaatgcaa agcttctgat ggatcctaag aggcagatct ttctagatca aaacatgctg   480

gcagttattg atgagctgat gcaggccctg aatttcaaca gtgagactgt gccacaaaaa   540

tcctcccttg aagaaccgga ttttttataaa actaaaatca agctctgcat acttcttcat   600

gctttcagaa ttcgggcagt gactattgac agagtgacga gctatctgaa tgcttcctaa   660
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<210> 7
<211> 660
<212> DNA
<213> artificial sequence

<220>
<223> Codon optimized Human IL-12 p35

<400> 7
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atgtgccccg cccgcagcct gctgctggtg gccaccctgg tgctgctgga ccacctgagc    60

ctggcccgca acctgcccgt ggccaccccc gaccccggca tgttcccctg cctgcaccac   120

agccagaacc tgctggcggc cgtgagcaac atgctgcaga aggccgcgca gaccctggag   180

ttctacccct gcaccagcga ggagatcgac cacgaggaca tcaccaagga caagaccagc   240

accgtggagg cctgcctgcc cctggagctg accaagaacg agagctgcct gaacagccgc   300
```
Page 6

```
gagaccagct tcatcaccaa cggcagctgc ctggccagcc gcaagaccag cttcatgatg      360

gccctgtgcc tgagcagcat ctacgaggac ctgaagatgt accaggtgga gttcaagacc      420

atgaacgcca agctgctgat ggaccccaag ctccagatct tcctggacca gaacatgctg      480

gccgtgatcg acgagctgat gcaggccctg aacttcaaca gcgagaccgt gccccagaag      540

agcagcctgg aggagcccga cttctacaag accaagatca agctgtgcat cctgctgcac      600

gccttccgca tccgcgccgt gaccatcgac cgcgtgacca gctacctgaa cgccacctga      660
```

```
<210>   8
<211>   660
<212>   DNA
<213>   artificial sequence

<220>
<223>   codon optimized Human IL-12 p35

<400>   8
atgtgccccg cccgcagcct gctgctcgtg gccaccctgg tgctcctgga ccacctcagc       60

ctggcccgca acctccccgt ggccacccca gacccggca tgttcccatg cctgcaccac      120

agccagaacc tgctggcggc cgtgagcaac atgctgcaga aggccgcgca gaccctggag      180

ttctacccct gcaccagcga ggagatcgac cacgaggaca tcaccaagga caagaccagc      240

accgtggagg cctgcctgcc cctcgagtta accaagaacg agagctgcct caacagccgc      300

gagacctcct tcatcaccaa cggcacttgc ctggcctccc gcaagaccag cttcatgatg      360

gccctgtgcc tgagctccat ctacgaggac ctgaagatgt accaggtgga gttcaagacc      420

atgaacgcca agctcctgat ggaccccaag ctccagatct tcctggacca gaacatgctg      480

gccgtgatcg acgagctgat gcaggccctg aacttcaaca gcgagaccgt gccccagaag      540

agcagcctgg aggagcccga cttctacaag accaagatca agctgtgcat cctgctgcac      600

gccttccgca tccgggccgt gaccatcgac cgcgtgacca gctacctgaa cgccacgtga      660
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<210>   9
<211>   58
<212>   DNA
<213>   artificial sequence

<220>
<223>   synthetic 5' UTR

<400>   9
aagcttactc aacacaataa caaacttact tacaatctta attaacaggc caccatgg        58
```

```
<210>   10
```

<211>   45
<212>   DNA
<213>   artificial sequence

<220>
<223>   synthetic intron where tract of random nucleotides not shown

<220>
<221>   misc_feature
<222>   (1)..(9)
<223>   5' splice site, where actual splice between nucleotide 3 and 4

<220>
<221>   misc_feature
<222>   (10)..(15)
<223>   optional restriction enzyme site

<220>
<221>   misc_feature
<222>   (15)..(16)
<223>   between 15 and 16 is the location of random sequence

<220>
<221>   misc_feature
<222>   (16)..(22)
<223>   branch point, where the actual branch point is nucleotide #21

<220>
<221>   misc_feature
<222>   (25)..(45)
<223>   3' splice site, where the actual 3' splice is between nucleotide
         44 and 45

<400>   10
caggtaagtg tcttctacta acggttcttt ttttctcttc acagg   45

<210>   11
<211>   16
<212>   DNA
<213>   Artificial

<220>
<223>   consensus 3' intron splice site,

<220>
<221>   misc_feature
<222>   (1)..(16)
<223>   The letter "N" can be any base.

The letter "Y" can be C or T.

<400>   11
yyyyyyyyyy ynyagg   16

<210>   12

```
<211>  271
<212>  DNA
<213>  artificial

<220>
<223>  artificial Poly A site 2XPA

<400>  12
tctagagcat ttttccctct gccaaaaatt atggggacat catgaagccc cttgagcatc      60

tgacgtctgg ctaataaagg aaatttattt tcattgcaat agtgtgttgg aattttttgt     120

gtctctcact cggtactaga gcatttttcc ctctgccaaa aattatgggg acatcatgaa     180

gccccttgag catctgacgt ctggctaata aaggaaattt attttcattg caatagtgtg     240

ttggaatttt ttgtgtctct cactcggtac c                                    271


<210>  13
<211>  122
<212>  DNA
<213>  artificial

<220>
<223>  synthetic intron


<220>
<221>  misc_feature
<222>  (1)..(9)
<223>  5' splice site, where the actual 5' splice site is between
       nucleotide 3 and 4

<220>
<221>  misc_feature
<222>  (10)..(15)
<223>  optional restriction enzyme site

<220>
<221>  misc_feature
<222>  (16)..(92)
<223>  "n" = random nucleotides, including optional restriction enzyme
       sites

<220>
<221>  misc_feature
<222>  (93)..(99)
<223>  branch point, where the actual branch point is nucleotide #98

<220>
<221>  misc_feature
<222>  (102)..(122)
<223>  3' splice site, where the actual 3' splice site is between
       nucleotides 121 and 122

<400>  13
caggtaagtg tcttcnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn      60
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nnnnnnnnnn nnnnnnnnnn nnnnnnnnnn nntactaacg gttctttttt tctcttcaca   120

gg   122

    <210>   14
    <211>   9
    <212>   DNA
    <213>   artificial

    <220>
    <223>   consensus 5' splice site

    <220>
    <221>   misc
    <222>   (1)..(1)
    <223>   The letter "m" stands for C or A.

    <220>
    <221>   misc
    <222>   (3)..(4)
    <223>   actual '5 splice site

    <220>
    <221>   misc
    <222>   (6)..(6)
    <223>   The letter "R" stands for G or A

    <400>   14
maggtragt   9

    <210>   15
    <211>   9
    <212>   DNA
    <213>   artificial

    <220>
    <223>   OPTIVS8 5' splice site

    <220>
    <221>   misc_feature
    <222>   (3)..(4)
    <223>   Actual splice site between nucleotides 3 and 4

    <400>   15
caggtaagt   9

    <210>   16
    <211>   7
    <212>   DNA
    <213>   artificial

    <220>
    <223>   consensus mammalian branch point

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<220>
<221>  misc_feature
<222>  (1)..(7)
<223>  The letter "Y" stands for C or T.

       The letter "R" stands for A or G.

       The letter "N" stands for any base.

<220>
<221>  misc_feature
<222>  (6)..(6)
<223>  Actual branch point

<400>  16
ynytray                                                                7


<210>  17
<211>  7
<212>  DNA
<213>  artificial

<220>
<223>  OPTIVS8 branch point

<400>  17
tactaac                                                                7


<210>  18
<211>  21
<212>  DNA
<213>  artificial

<220>
<223>  3' splice, with polypyrimidine tract extended to 16 bases


<220>
<221>  misc_feature
<222>  (1)..(16)
<223>  The letter "Y" stands for C or T.

<220>
<221>  misc_feature
<222>  (17)..(17)
<223>  The letter "N" stands for any base.

<220>
<221>  misc_feature
<222>  (18)..(18)
<223>  The letter "Y" stands for C or T.

<220>
<221>  misc_feature
<222>  (20)..(21)
<223>  Actual 5' splice site
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<400> 18
yyyyyyyyyy yyyyyynyag g   21

<210> 19
<211> 21
<212> DNA
<213> artificial

<220>
<223> OPTIVS8 3' splice site with 7 consecutive Ts

<220>
<221> misc_feature
<222> (17)..(17)
<223> The letter "N" stands for any base.

<220>
<221> misc_feature
<222> (18)..(18)
<223> The letter "Y" stands for C or T.

<400> 19
ttcttttttt ctcttcnyag g   21